horizontal antennæ being thus utilised. The observations were not sufficiently numerous to justify definite conclusions being drawn, but so far as they went they tended to support Mr. Marconi's results as to the southerly origin of these disturbances.

The aërials of many stations are, of course, to some extent directive, and this may account for the comparative immunity of one station from atmospherics while another in its vicinity is more disturbed by them, although both might be affected equally by local thunderstorms.

WILFRED HALL.
H. MORRIS-AIREY.

9 Priors Terrace, Tynemouth,
Northumberland, January 12.

A Recently Discovered Stone Circle, near Matlock, Derbyshire.

ON the summit of "Bilberry Knoll," in the district of Matlock, latitude 53° 7′ 1½″, and longitude 1° 32′ 15″ W., there are remains of what I believe to have been an important station in prehistoric times, dedicated to the sun-worship cult.

The highest point of the hill is crowned by a mound, obviously artificial, built up of large boulders and earth, and, although much disturbed, many of the stones occupy positions in which they were originally placed. Some of them appear to form part of the circumference of a circle with thirty-six bays, or divisions, of 144 ft. diameter. Near the centre there are two chambers, one in horse-shoe form, and the axis through these chambers is in line with the "Nine Ladies," a well-known circle, on Stanton Moor.

The range of hills (of which Bilberry Knoll forms the highest point, 928 ft. above O.D.) occupies a very strong natural position, and the summit was apparently further protected by ramparts, remains of which may be seen about 200 yards south of the circle mound.

The circle commands an extensive view in every direction, and there are in sight more than thirty positions which bear distinctive names.

To discover the significance of some of these positions I have taken observations of the sunset on those days usually regarded as sacred in the "Druidical," or sun-worship cult, more particularly of the May Eve and June Solstice festivals. But sunsets down to the horizon are rare, and I had no data by which to determine the true date of *May Eve.* I ultimately decided on May 11 as being consonant with May Eve (old style), and this year, on that date, the *full disc* of the sun rested upon a distant horizon (altitude 10′), exactly over the intersection of intervening hills, on an alignment N. 58° 00′ W.

At the June solstice the results were more decisive, the sunset being almost exactly over the "*Nine Ladies.*" This well-known circle lies a little more than five miles away, N. 46° 30′ W., and the height of horizon is about 13′. And N. 46° 00′ E., with a similar altitude, stands "Blakelow Hill"; this hill would thus indicate the rising sun, and, conjointly with the "Nine Ladies," provides irrefutable evidence of purpose. For, whereas "Blakelow Hill" is a distinctive natural feature, the "Nine Ladies" occupies a *chosen* site, slightly below the highest ground, on a broad plateau. And, whilst it is in sight, and indicates the sunset from "Bilberry Knoll," it is not in sight from a circle only 1¾ miles away on Harthill Moor, nor from "Arbor Low," which is within 5½ miles, though a difference of very few yards in position, on higher ground, would have placed it in sight of all three. It was therefore clearly established as an adjunct to "Bilberry Knoll."

Comparing these results with data which I have since obtained from Sir Norman Lockyer's valuable work on "Stonehenge," I find the alignment for sunset on May 6 to be about N. 61° 00′ W., but the date actually observed appears to be subject to local variation, the Roman calendar being May 9 (the date of a fair day at Matlock). Making allowance for this, and for variation in obliquity of the ecliptic, it seems probable that this hill intersection would indicate the sunset on the eve of the May year festival.

The alignment for the June solstice I make N. 47° 15′ W., which is so near as practically to confirm my conclusions.

Investigations on the various sites would, I believe, prove that the better-known Derbyshire circles, "Arbor Low," the "Bull Ring" at Dove Holes, and "Wet Withins" on Eyam Moor, were also established with alignments to distinctive features that would indicate the rising and setting sun on these dates.

JOHN SIMPSON.

Spring Mount, Bank Road, Matlock,
January 5.

Trepanning among Ancient Peoples.

A NOTE in NATURE of October 30, 1913, p. 273, referring to the late Dr. Lucas Championnière's paper on prehistoric trepanning, which was read at the last annual public meeting of the Five Academies in Paris, contains this observation :—

"It is remarkable that the operation was not practised among highly civilised races like Greeks, Egyptians, Arabs, Hindus, and Chinese. . . ."

But the subjoined quotations would seem to militate with the soundness of this expression so far as it concerns the ancient peoples of Greece and India :—

"In surgery his (Hippocrates's) writings are important and interesting, but they do not bear the same character of caution as the treatises on medicine; for instance, in the essay 'On the Injuries of the Head,' he advocates the operation of 'trephining' more strongly and in wider classes of cases than would be warranted by the experience of later times" ("Encyclopædia Britannica," 1910, vol. xiii., p. 518).

"The next most elaborate chapter (of the Hippocratic collection) is that on wounds and injuries of the head. . . . Trephining was the measure most commonly resorted to, even where there was no compression" (*ibid.*, vol. xxvi., p. 125).

"Jīvaka (afterwards termed the King of the Physicians) had learnt the whole art of healing with the exception of the operation of skull-opening. Now a man who was afflicted by a cerebral malady came to Atreya (Jīvaka's master) and asked him to treat him. Atreya replied that the man must dig a pit that day and provide it with dung. . . . When Atreya came, he placed the man in the pit, opened his skull, and was about to seize the reptile with his pincers (when Jīvaka advised him how to take it away). . . . When all this had been done the man was cured" (E. A. von Schiefner, "Tibetan Tales," trans. Ralston, 1906, p. 98). The same book, p. 100, relates how Jīvaka cured a man whose head itched greatly by drawing out of his skull a centipede through the same operation. In the "Lives of Jīvaka and Amrapālī (his mother)," translated into Chinese in the second century A.D., he is said to have used a golden knife in skull-opening.

"Les Saniassis sont enterrés jusqu'au col; un Religieux du même ordre casse des cocos sur la tête du mort jusqu'à ce qu'elle soit brisée; ensuite on la couvre de terre. On ignore aujourd'hui le motif de cette pratique singulière, à moins que ce ne soit pas pour faciliter à leur âme le moyen de sortir par une ouverture plus honnête que la bouche, les oreilles et

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d'autres issues du corps, qu'on regarde comme impures et souillées" (Pierre Gonnerat, "Voyage aux Indes Orientales et à la Chine," à Paris, 1782, vol. i., p. 93).

KUMAGUSU MINAKATA.

Tanabe, Kii, Japan, December 13, 1913.

Systems of Rays on the Moon's Surface.

A GREAT deal has been said, and a great many theories have been put forward, as to the cause of these marvellous systems of rays on the surface of the moon. I now venture to put forward an explanation which has occurred to me, and should like the opinion of some of your readers upon it.

It is generally admitted that the volcanic action of the moon was of an enormous character, "even when the low force of lunar gravity is taken into consideration," and from our knowledge of the amount of lava emitted from one of our own small craters, we can conceive what a huge volume must have been thrown out from such gigantic craters as Clavius, Ptolemäus, or Copernicus. Now, from what we can see even to-day, the lunar surface is exceedingly mountainous, and I suggest that when these craters were in their full power huge volumes of lava were thrown out, and in many cases practically filled up valleys, or cañons between the mountains. We know the rays are from five to ten miles broad, even up to twenty miles, and from the action of the volcano there would always be the tendency for the lava to run away from the crater itself, thus forming these rays, like spokes from a hub. Some of the rays are, however, apparently of a prodigious length, up to 2000 miles long, but Prof. Pickering tells us that this length is an illusion, the long rays being made up of rays from different craters, which appear to form one long continuous ray, which satisfies the question of length.

Then many of these rays apparently run right across and almost obliterate (at full moon) such craters as Clavius and Maginnus. Now I think it is generally admitted that the ray systems from Tycho, Copernicus, and Kepler are the largest on the moon, and they are also three of the very largest craters. This points to the fact that they were the first eruptions on the lunar surface, and being the first, threw out the greatest volume of lava. This filled up the valleys in their neighbourhood, but afterwards other craters were erupted through the lava-covered rocks, though without breaking up the "lava valleys." It is highly probable that in these circumstances most, or all, the craters have their rays, though too small to be detected through even the largest glass. Their brilliance would, of course, be accounted for, by the sun shining directly upon them, through no atmosphere at all, or none worth mentioning. It seems, therefore, to me, that these rays must be geologically old remains of eruptions, dried up now, but still showing themselves on the lunar surface, though it is doubtful if the matter will ever be satisfactorily cleared up.

C. HUBERT PLANT.

49 Lichfield Road, Walsall, December 16, 1913.

THE CAPE OBSERVATORY.[1]

IN the preface to this work Sir David Gill relates that when, as a young astronomer, he was connected with Lord Crawford in the design and erection of the observatory at Dun Echt, he turned for assistance to Wilhelm Struve's "Description de l'Observatoire Astronomique Central de Poulkova." Remembering the help and pleasure which Struve's work had given him, he resolved, in humble imitation, to write a description of the Cape Observatory.

"Struve," in the words of Gill, "had the true genius and spirit of the practical astronomer, the love of refined and precise methods of observation, and the inventive mechanical and engineering capacity."

Struve had the rare opportunity of building an observatory after his own heart, regardless of expense, which should fulfil the highest requirements of the astronomy of his time. Gill, animated by the same spirit as Struve, and with similar qualifications, greatly extended and remodelled an historic observatory. Thanks to his grasp of the trend of astronomy, his skill in the design and construction of instruments, and his administrative ability and energy, he left the Cape Observatory, at the close of his directorate, one of the best equipped and most efficient observatories in the world.

The volume, as its title indicates, is divided into two parts. The first consists of a history of the observatory from its foundation to the present time, with brief biographical notices of those who have filled the position of H.M. Astronomer, and an appreciative criticism of their work and their contribution to the development of the observatory. Following this is a brief account of the past and present instrumental equipment, and a comprehensive survey of the important astronomical and geodetic results which have proceeded from the Cape Observatory. The second part of the book is devoted to a detailed description, illustrated by many photographs and diagrams, of the important instruments which have been erected at the observatory during Sir David Gill's directorate.

The value of the Cape as a site for the extension of astronomy and geodesy to the southern hemisphere was first appreciated by Lacaille, who in a brief visit in the middle of the eighteenth century made observations of the positions of more than 10,000 stars, and measured an arc of the meridian.

After the British occupation, the establishment of a permanent observatory at the Cape was considered by the Board of Longitude in February, 1820; the appointment of an astronomer was recommended, and estimates were obtained from Troughton, Dollond, and Jones for suitable equipment. The Board of Admiralty expressed its concurrence with this proposal, and the observatory was established by Order in Council on October 20, 1820, the staff to consist of one astronomer, one assistant, and one labourer.

The Rev. Fearon Fallows, fellow of St. John's College, Cambridge, was appointed H.M. Astronomer, and directed to make observations so far as possible similar to and complementary to those at Greenwich. He fixed the site of the observatory on part of a bare, rocky hill, covered with thistles and infested with snakes, but tolerably free from the sandy dust prevalent near Cape Town, and commanding a good view of Table

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[1] "A History and Description of the Royal Observatory, Cape of Good Hope." By Sir David Gill K.C.B. F.R.S. Pp. cxc+136+plates. (London: H.M. Stationery Office, 1913.)

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